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Les documents fixés à cette attestation sont conformes à la version initialement déposée de la demande de brevet européen spécifiée à la page suivante.

Patentanmeldung Nr. Patent application No. Demande de brevet n°

03013571.9

Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
p.o.

R C van Dijk

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Anmelder/Applicant(s)/Demandeur(s):

SIEMENS AKTIENGESELLSCHAFT
Wittelsbacherplatz 2
80333 München
ALLEMAGNE

Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:
(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
If no title is shown please refer to the description.
Si aucun titre n'est indiqué se referer à la description.)

Communications system

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PT RO SE SI SK TR LI

Description

Communications System

This invention relates to a communications system, particularly to a Universal Mobile Telecommunications System (UMTS), a method for transmitting data in a communications system, and a base station system.

The transmitted data at the base station of a 3GPP W-CDMA (FDD) cellular radio system can be divided into time continuous traffic (DCH, CCH) and burst like control data, which is in particular the synchronization channel (SCH) [2].. The SCH is time multiplexed with the primary common control physical channel (P-CCPCH). Traditional network configuration assumes equal power for SCH and P-CCPCH such that the sum power level is constant over time. This situation is illustrated in figure 1. "BS- Power" means the transmit power at the base station. Please note that the CDMA system capacity is limited by its self interference, which is in particular caused by all non desired users and the control channels. Thus the capacity is given by the ratio of area of the DCH block divided by the total area in figure 1.

Currently, it is a standard requirement that also the DCH-power of each traffic channel is either constant during the whole slot or may change with fixed power steps at more or less random time instances within the slot . These instances are random in time because of the many different DCH slot formats and the additional timing offset for each DCH relative to the SCH [2].. This is also illustrated in figure 1.

In the context of "identification of a new cell", it has been recognised that an increased power level for the SCH compared to the P-CCPCH is necessary. This is meanwhile reflected in a respective change of standard requirements (see [3], [4]).

Figure 1 and figure 2 show a dashed line, which represents the maximum power amplifier (PA) level at the base station (BS). This level is an important design parameter of a BS because it has significant impact on cost, size and power consumption of the whole base station.

Currently the 3GPP standard allows an increase of the SCH power only in a way as depicted in figure 2. A discontinuity of the transmitted power over time is introduced. Two power budged options are shown in figure 2:

Option one on the left hand side keeps the sum power always below the "amplifier power limit". The spectral distortion of the BS transmit signal due to discontinuity can be neglected. The System capacity, however, is considerably reduced, because the total DCH-power (area of the DCH block) compared to the sum power reduces.

Option two on the right hand side of figure 2 exploits the full mean power the base station (sum area of all channels corresponds to "maximum mean power") and the capacity loss is relatively low . The peak power, however, is increased and due to the non-linearity of the BS power amplifier, spectral distortion of the transmit signal occurs.

The change of requirements, which demands for increased SCH-level, is quite new. Based on the current W-CDMA standard known solutions are shown in figure 2. This means either

considerable system capacity loss or more expensive, larger and less efficient power amplifier.

Based on the foregoing description it is an object of the invention to provide a communications system, a method for transmitting data and a base station system, that enable a reliable synchronisation in a communications system.

The object of the invention will be achieved with a communications system, a method for transmitting data and a base station system, which are defined by what is disclosed in the appended independent claims. Advantageous embodiments of the present invention will be presented in the dependent claims.

The reduction of the transmit power of the dedicated channels can be different for different dedicated channels.

Each dedicated channel can be related to one mobile station. Some dedicated channels can be related to the same mobile station.

Each common channel can be related to at least two mobile stations.

One special idea underlying an embodiment of the invention is to keep the sum power over all physical channels at a constant level and to decrease the DCH power during SCH-transmission for that purpose.

In the following, the invention will be described by means of preferred embodiments with reference to the accompanying drawing, in which:

Figure 1 shows traditional power budget of W-CDMA physical channels at the base station (prior art);

Figure 2 shows power distribution of W-CDMA physical channels at the base station to cope with new requirement for cell (prior art);

Figure 3 shows a schematic view of a reduction of the DCH transmit power ("Traffic Channel Cutback").

With regard to figure 3 it should be noted, that the signal level reduction occurs asynchronously to the DCH slot and field boundaries. This kind of DCH-power reduction is currently not allowed by the standard. EVM requirements would for example be violated. Thus modification of the standard by introducing additional parameters and information elements is required.

There are different alternatives and modifications of the basic idea like:

- Switching between fully loaded and partially loaded system: DCH power truncation is turned off in case of only partially loaded system: The spectral degradation due to sum power bursts (SCH) are not critical and individual link quality can be kept optimum instead.
- Selective reduction of DCH level during SCH transmission based on service specific quality requirements or certain DCH-fields.

Advantages gained by the traffic channel cutback: traffic channel cut back during SCH transmission balances the sum power along the slot. This improves the spectral behaviour of the (power limited) amplifier and makes the power amplifier cheaper, smaller and more efficient. The system capacity degradation is relatively low because the total power assigned to DCH-traffic is high.

References:

[1] 3GPP TS25.101: UE Radio Transmission and Reception (FDD)

[2] 3GPP TS25.211: Physical channels and mapping of transport channels onto physical channels (FDD)

[3] 3GPP TS25.133: Requirements for Support of Radio Resource Management (FDD)

[4] TSG-RAN WG4#25, R4-021580: On Cell Identification in Multi-Path Fading Conditions

Claims

1. A communications system comprising
   - a plurality of common channels (P-CCPCH, CCH) including a primary common control physical channel (P-CCPCH),
   - a plurality of dedicated channels (DCH)
   - a synchronisation channel (SCH),
   - the primary common control physical channel (P-CCPCH) and the synchronisation channel (SCH) being transmitted time multiplexed, and
   - the transmit power of dedicated channels (DCH) being reduced during the transmission of the synchronisation channel (SCH).

2. The communications system according to claim 1,
   - the common channels and the dedicated channels being transmitted code multiplexed.

3. The communications system according to claim 1 or 2,
   - the communication system being a Wide-Band-CDMA-System (WB-CDMA)

4. The communications system according to claim 1, 2 or 3,
   - the communication system being a Universal Mobile Telecommunications System (UMTS)

5. The communications system according to claim 1, 2, 3 or 4,
   - the reduction of the transmit power of dedicated channels (DCH) being such that the total transmit power of the used channels is substantially constant.

6. A method for transmitting data in a communications system,

- the communications system comprising
- a plurality of common channels (P-CCPCH, CCH) including a primary common control physical channel (P-CCPCH),
- a plurality of dedicated channels (DCH), and
- a synchronisation channel (SCH), whereby

the primary common control physical channel (P-CCPCH) and the synchronisation channel (SCH) are transmitted time multiplexed, and

the transmit power of dedicated channels (DCH) is reduced during the transmission of the synchronisation channel (SCH).

7. A base station system for transmitting data in a communications system,

- the communications system comprising
- a plurality of common channels (P-CCPCH, CCH) including a primary common control physical channel (P-CCPCH),
- a plurality of dedicated channels (DCH), and
- a synchronisation channel (SCH),
- the base station system being arranged such,
- that the primary common control physical channel (P-CCPCH) and the synchronisation channel (SCH) are transmitted time multiplexed, and
- that the transmit power of dedicated channels (DCH) is reduced during the transmission of the synchronisation channel (SCH).

Abstract

Communications System

A communications system is described, the communications system comprising

- a plurality of common channels (P-CCPCH, CCH) including a primary common control physical channel (P-CCPCH),
- a plurality of dedicated channels (DCH)
- a synchronisation channel (SCH),
- the primary common control physical channel (P-CCPCH) and the synchronisation channel (SCH) being transmitted time multiplexed, and
- the transmit power of dedicated channels (DCH) being reduced during the transmission of the synchronisation channel (SCH).

Figure 3

FIG 3

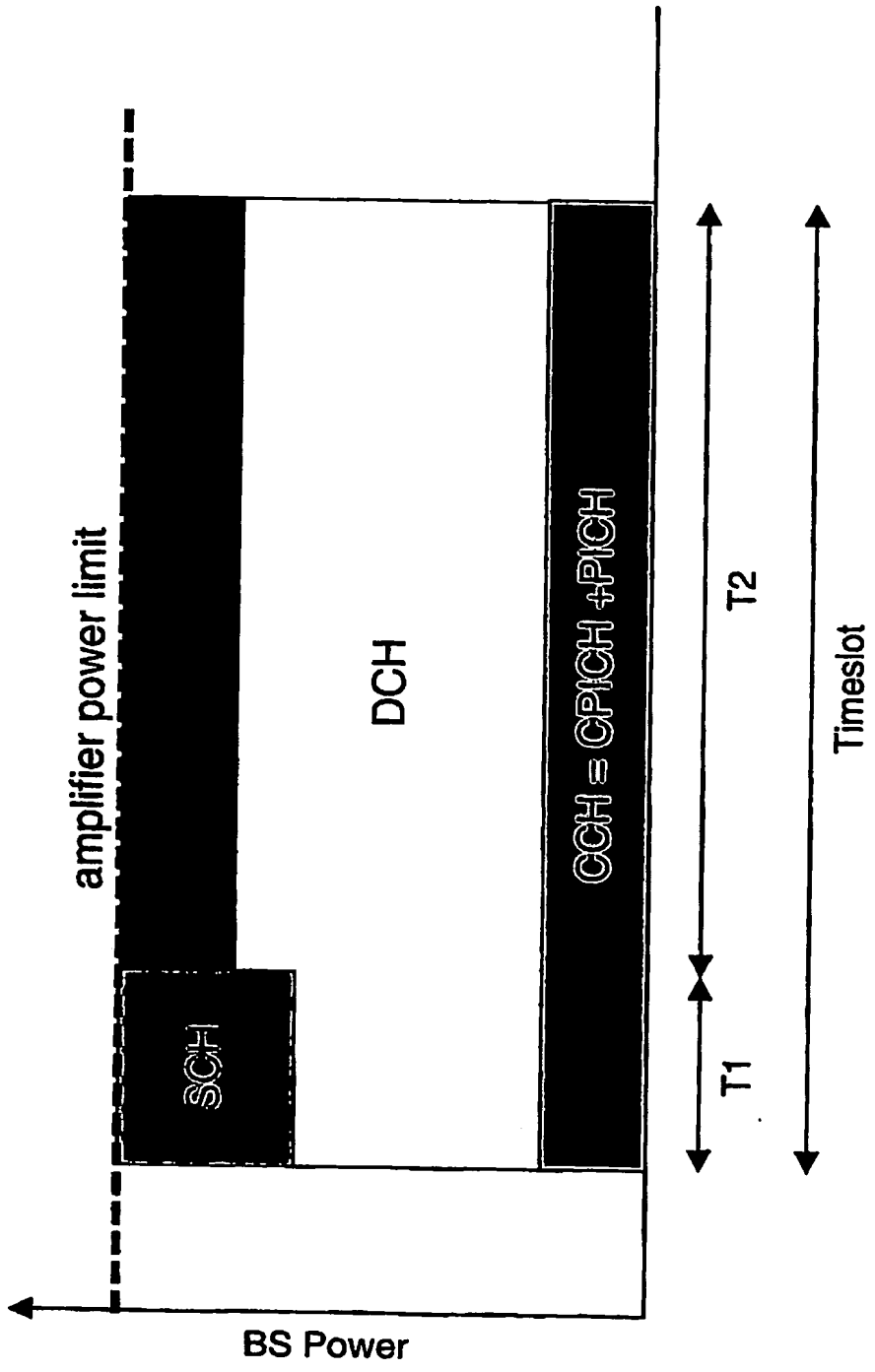


FIG 1

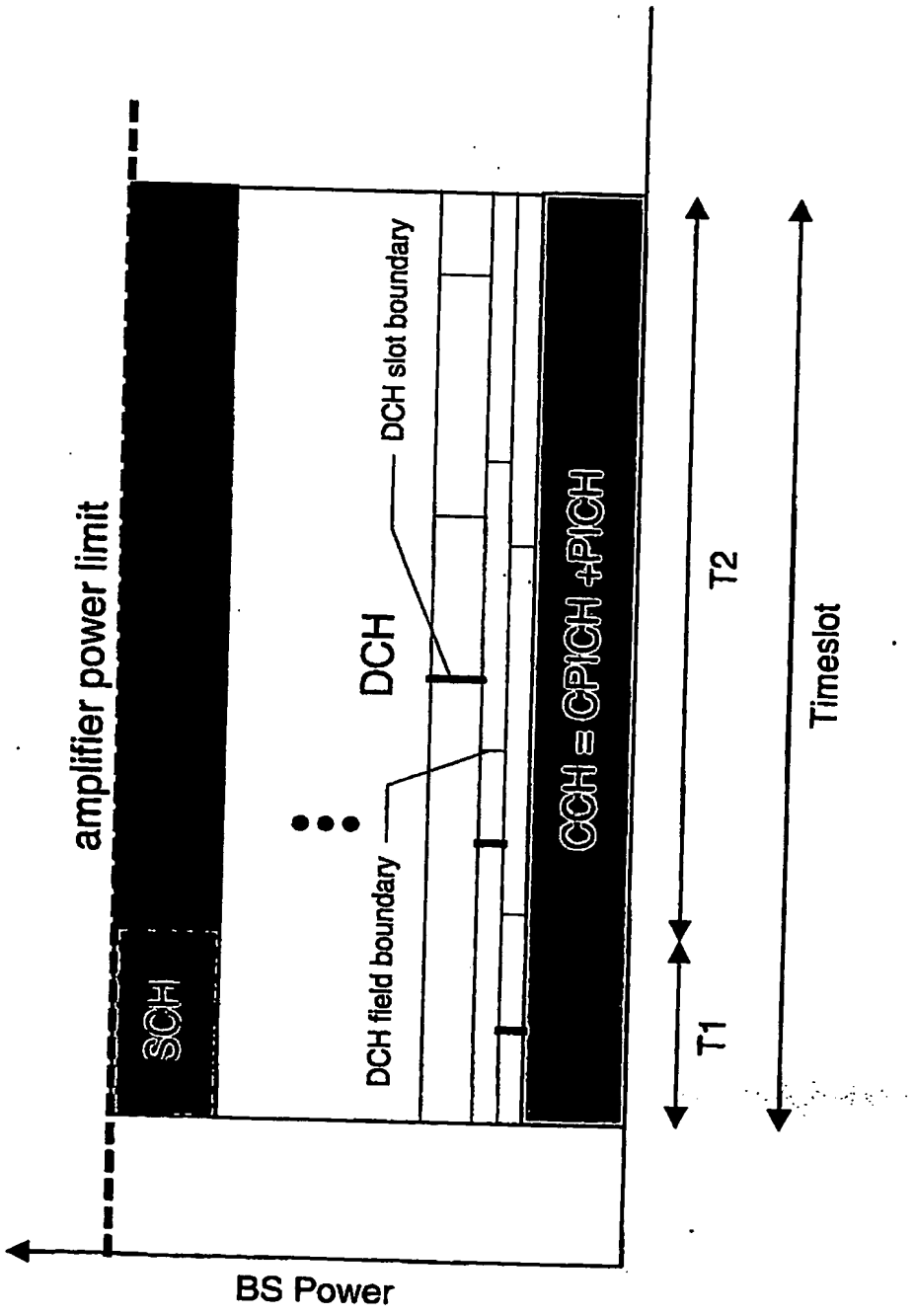
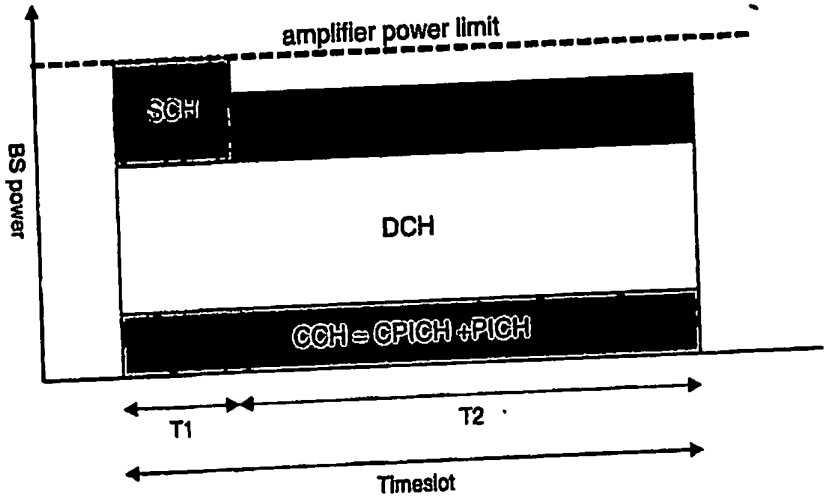


FIG 2


amplifier power limit
SCH
DCH
CCH = CPICH +PICH
BS power
T1
T2
Timeslot

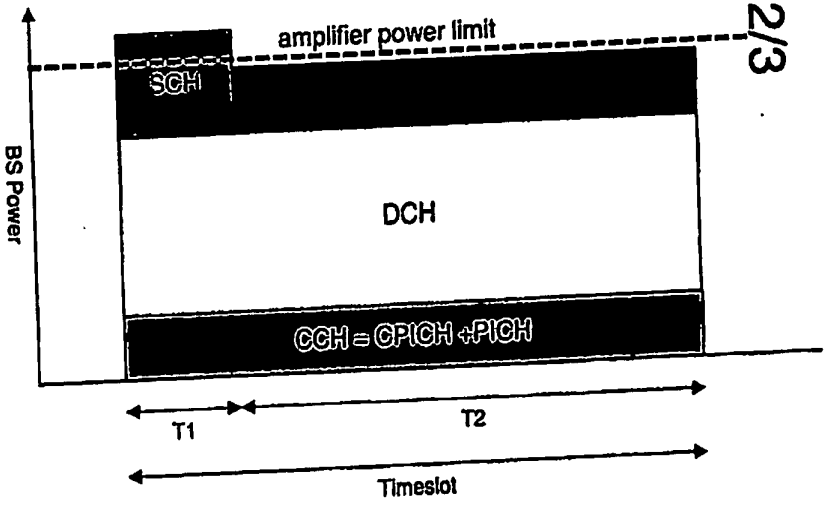

amplifier power limit
SCH
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FIG 3